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MARY CYNTHIA DICKERSON, *Editor*

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By courtesy of W. J. Sinclair

RANCHO–LA–BREA

The old ranch-house, with pool in foreground where asphalt was excavated for commercial purposes forty years ago. A bursting bubble of gas in centre foreground

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THE ASPHALT GROUP OF FOSSIL SKELETONS

THE TAR-PITS OF RANCHO-LA-BREA, CALIFORNIA

By W. D. Matthew

THE Museum has just completed and placed on exhibition a group to illustrate one of the most marvelous fossil deposits of the world. This is the famous asphalt formation of Rancho-la-Brea near Los Angeles, California.

The petroleum of southern California, as in most of the West, has an "asphalt base" — that is to say when it evaporates, the heavy oils left behind are asphaltum instead of paraffin. Wherever the petroleum oozes up from the earth in springs, this residuum of asphalt accumulates. The oil wells up continually from below and keeps it soft close around the spring, but elsewhere it is hardened into a solid mass mixed with earth or wind-blown dust. At the Rancho-la-Brea, in the centre of a broad open valley close to the city, is an extensive formation of this sort, made by oil springs which were probably much more active in former times than now. Here and there on the surface are little pools of semi-liquid asphalt, covered with a film of dust in dry weather, with water after a rain, yielding slowly beneath the weight and clutching with unbelievable tenacity whatever sinks beneath the surface. To the inexperienced eye the dust-covered surface looks like firm ground; except in the softer pools one can walk across it without any considerable yielding. But woe to the unfortunate animal that steps into one of the softer pools, or lingers on his way across a firmer surface to look about him or to drink of the water collected over the asphalt surface. His feet sink below the surface, the treacherous tar clutches them fast, and his most desperate struggles result only in sinking him deeper and deeper. Escape is impossible; he succumbs finally to exhaustion and little by little is sucked down and disappears.

Such has been the fate of many small animals in the last few years. Larger animals too, cattle, horses and dogs have been caught in the asphalt, some dragged out by the aid of ropes, while others not seen in time for rescue, have perished miserably. But the tar-pits although cruelly effective to the limit of their size, are not now large or numerous enough to constitute a serious danger.

At the time when these springs were active the asphalt pools were much

By courtesy of W. J. Sinclair

THE FOSSIL BEDS AT RANCHO-LA-BREA

Excavation for fossils in the middle distance, and beyond, the oil-wells tapping the petroleum deeper down in the shales. The Santa Monica Mountains are in the background

By courtesy of W. J. Sinclair

Excavating for fossils at La Brea. Many white weathered fragments of bone are scattered over the surface. Oil-wells in the distance

larger and more numerous and formed a death-trap of terrible efficiency for the numerous animals that inhabited the valleys and plains of that region. This was in the Pleistocene Period, during the Glacial Epoch, when much of the northern part of the continent was buried under great fields of ice. Southern California, far below the southern limits of glaciation had probably a less arid climate than now, and a very large and varied animal population, mostly of extinct species and some of them very widely different from the living animals of the region.

Excavations for road asphalt in this formation were commenced in 1874 by Major Hancock, the owner of the ranch. The material was melted down to free it from impurities and shipped in barrels to San Francisco and elsewhere. The work was not continued as the cost of purifying the product was too high for it to find a profitable market at that time. It served to call attention to the fact that the asphalt contained numerous bones or fragments of bones, and when examined by scientists it appeared that these were not modern bones but belonged to extinct animals. Prospecting for fossils soon showed that around the little oil springs or where springs had formerly come up, there were pipes or chimneys of soft asphalt, which were veritable ossuaries, packed full of the bones of these extinct animals, mostly in marvelous preservation. The excavations of the local scientific societies and the more extensive work carried on by the University of California have yielded many hundreds of skulls and tens of thousands of skeleton bones, of a great variety of animals large and small. The bones are impregnated with asphalt, otherwise little altered; but flesh and hide, horns and hoofs

THE ASPHALT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

The new group [fourth floor, east wing] shows the sabre-tooth tiger to the left, extinct wolf to the right and ground sloths in the foreground

have completely disappeared, dissolved out by the petroleum and long since converted into bitumen, water and gases. The skeletons are never articulated; the bones are all jumbled up together in a crowded mass by the slow internal movements of the half-liquid asphalt in which they were entombed thousands of years ago.

It is safe to say that the La Brea asphalt is the richest repository of fossils ever discovered, if we consider the variety of extinct animals found in it, the perfect preservation of their remains and the ease with which they can be extracted and cleaned up. It is practically unique: asphalt deposits of this type are common enough wherever an asphalt base petroleum comes or has formerly come to the surface, but bones have rarely been found in them and never upon any such scale as this.

How many kinds of animals are represented in the collection is not yet known. Over fifty species of birds have been identified, and there are probably at least as many kinds of mammals. The most remarkable fact is the great abundance of carnivorous quadrupeds and birds of prey. Wolves, lions and sabre-tooth tigers, eagles and vultures are the most common of all the remains found; next to them stand the larger herbivora, bisons, horses, ground sloths and larger ruminants and wading birds; while remains of smaller quadrupeds and perching or ground birds are comparatively rare. This is a fact of grim significance, for it indicates that the larger quadrupeds, venturing out upon the seemingly solid surface and caught in the asphalt, served as a bait for animals and birds of prey, luring them from all the country round about and enticing them within the treacherous clutch of the trap. These in their turn, falling victims, served to attract others of their kind. And so the "death-trap of the ages," as a poetically-minded Californian writer called it, self-baiting, automatically disposing of its prey, has collected and preserved to our time a truly wonderful series of the predacious animals and birds. The smaller animals, light and active and seldom venturing beyond the brink of the pool, were not often caught.

In February of this year (1913) the writer paid a visit to this locality at a time when excavations were in progress for the University of California. The object was to study the conditions at the "tar-pits" as a guide to the construction of a characteristic group exhibit for the American Museum, and to secure by exchange with the Californian museums a full representation of the fossil fauna. Every possible courtesy was received from the several institutions mentioned in getting together the necessary data and materials and especially from Professor J. C. Merriam of the University of California. The group as it stands is based chiefly upon the studies and conclusions of Professor Merriam, so far as we have succeeded in understanding and expressing them correctly. In effect, it is meant to convey a picture of the operation of this Pleistocene death-trap. No attempt is made to cover the skeletons with flesh and hide — this the visitor may imagine for

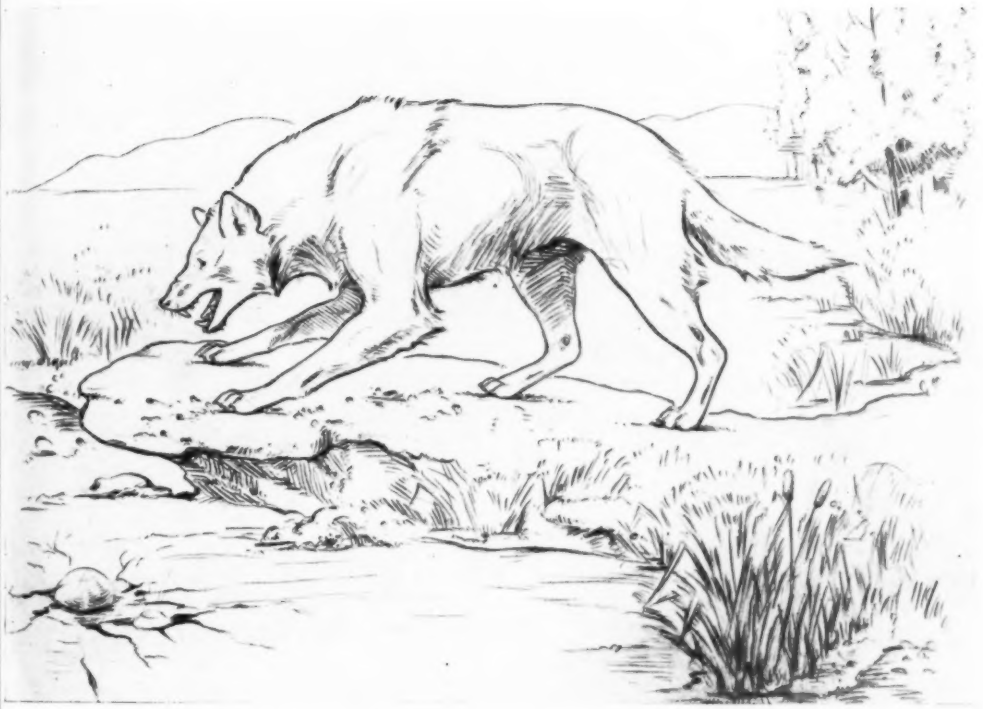
Restoration of the sabre-tooth tiger (*Smilodon californicus*) by Erwin Christman. A ground sloth (*Mylodon*) is nearly submerged in the asphalt pool

himself; and add if he pleases the scanty vegetation of a dry country around the margins of the asphalt spring.

Two ground sloths (*Mylodon*), great heavy, thick-haired, clumsy, clawed beasts distantly related to the living tree sloths, but as big as a grizzly bear, have been caught in the asphalt. In spite of their struggles indicated in the disturbed and broken surface of the pool, they have sunk down until only the head and fore limb of one, and the head of the other, appear above the black asphalt.

A sabre-tooth tiger (*Smilodon*) one of the most powerful and dangerous of the extinct beasts of prey has been attracted by the struggles of the hapless ground sloths, and hastened to the spot to kill and devour them. But in his eagerness, he too has been trapped and is now vainly trying to extricate his feet, already beginning to sink below the surface.

Meanwhile, a fourth animal, the great extinct wolf (*Canis dirus*) has come up. More wary, or as yet more fortunate, he has come over the solid hardened asphalt, and avoided the treacherous surface of the pool. He sees his ancient and dreaded enemy the sabre-tooth and the powerful and bulky ground sloths in difficulties where neither teeth nor claws will avail against his attack. He dare not yet spring in to attack them but leaps about on the margin of the pool in high excitement, barking out his real opinions in regard to sabre-tooth tigers, which under ordinary circumstances he would reserve to a safer margin of distance. The *Smilodon*, distracted for a moment from his desperate attempts to free his feet from the entangling mass,



Restoration of the extinct wolf (*Canis dirus*) by Erwin Christman. Asphalt pool in foreground with a bursting gas bubble

answers with a savage snarl, which we may interpret as a wish, soon to be fulfilled, that the wolf would bear him company in his troubles.

Such is the little drama that our group sets forth. A realistic story it is — a characteristic incident which must have happened, pretty much as we have told it, again and again during the time — many thousands of years ago — when these tar-springs were active.

That thousands upon thousands of animals, great and small, perished by this frightful death in the tar-pits of La Brea, is witnessed by their skeletons; that so large a proportion of them were savage beasts of prey may be to some a consolation, although nature accords no higher place or superior morality to the vegetarian over the carnivore. At all events it does not appear that the trap was seen by human eyes in the days of its vigor. No remains of man, tools, weapons, or other indications of his presence have been found associated with the extinct animals. There are various reasons for the belief that man is rather a recent arrival in the New World, and had not reached the Pacific Coast when these animals were perishing in such numbers in the tar-pits. Still he might have witnessed it.

The fossil skeletons used in preparing this group were presented in exchange by the University of California, through Professor J. C. Merriam, to whom we are also indebted for most of the evidence upon which their grouping is based, and many helpful suggestions and criticisms.

GUN-BEARERS OF THE EXPEDITION

Wild men of the Cheringani Hills hunted with members of the expedition, giving loyal coöperation throughout the work

TRACKERS OF THE CHERINGANI HILLS

HUNTING THE RHINOCEROS[1] IN BRITISH EAST AFRICA FOR CONSTRUCTION IN THE AMERICAN MUSEUM OF A GROUP OF THIS FAST-DISAPPEARING SPECIES

By W. S. Rainsford

Photographs by Jenness Richardson

"IF I could only meet that great bull elephant, the bull of my dreams, the mighty tusker who will some day be seen by some lucky mortal, hide he never so cunningly, I think I could scarcely shoot him until I had hugged him for joy." This remark shows the enthusiasm and keen determination of one of our persistent hunters and naturalists. Little know the people as they gaze in some natural history museum at some fine beast or bird, labeled with a half understood name, coming from a half unknown land — little do these people know at what cost paid in adventurous human life the stuffed specimen they admire is presented to them. Hunters, explorers, collectors, soldiers, civil servants, missionaries — the African sphinx follows her Grecian cousin's example and may strangle them if they persist in the attempt to unravel her riddles.

The ideal African hunter or expedition leader should have the endurance of a man under forty years old, should have a copper-lined stomach and be immune to tick, tsetse and mosquito. Climatic conditions should mean nothing to him. He should prefer the borderland of a swamp or even its pestiferous depths to the breezy upland if only he can win the one thing he is after.

British East Africa has had many secrets wrested from her in the past

[1] Editorial Note:— The American Museum does not possess a group of the common black rhinoceros of Africa. In face of the fact that this rhino like the buffalo and zebra is positively doomed to extermination in the near future because an annoyance to settlers in the country, it seemed advisable to take steps to get material for such a group while rhinos of maximum size are still to be found.

As to big-game conditions in British East Africa, unusual interest attaches to the following quoted from a recent publication of the New York Zoölogical Society, *Our Vanished Wild Life*, by William T. Hornaday:

"As matters stand to-day in British East Africa, the big game of the country outside the three preserves is absolutely certain to disappear in about one-fourth the time that it took South Africa to accomplish the same result. The reasons are obvious: superior accessibility, more deadly rifles, expert professional guides and a widespread craze for killing big game.

"...With care and economy, British East Africa should furnish good hunting for two centuries... Mr. Arthur Jordan has seen much of the big game of British East Africa, and its killing. Him I asked to tell me how long, in his opinion, the big game of that territory will last outside of the game preserves as it is now being killed. He said, 'Oh, it will last a long time. I think it will last fifteen years.'

"*Fifteen years!* And this for the richest big-game fauna of any one spot in the whole world, which Nature has been *several million years in developing and placing there!*....

"The bag limit... is ruinously extravagant.....It is awful to think that for a petty sum [$250.00] any man may buy the right to kill *300 head* of hoofed and horned animals of 44 species, not counting the carnivorous animals that also may be killed. That bag limit should *immediately* be reduced *75 per cent.*"

fifty years. To-day the country with its railroad line and government road and its large population of colonists is no longer the place that it was for finding large game. The Third African expedition of the American Museum had received permission to kill four rhinos and three buffalo in British East Africa — in the wilderness, not in one of the game preserves — but felt considerable indecision as to the right locality for the work. Even

Some of the wild men of the Cheringani Dorobo who worked for the expedition. None of these natives had met a white man before the leader of the expedition went among them in 1908 when on a previous visit to Africa

three or four years ago good specimens of African mammals could be obtained along the Uganda railroad. They have now disappeared not only from there but also from many of the localities farther afield. Such is the case in regard to rhinos in the region south of the Uganda railroad and west of the Guaso Nyiro River near the German borderland. Rhinos are found

To keep the expedition supplied with food a small herd of donkeys traveled between depots in the hills and the lower country. A donkey load is 120 pounds

An African leopard. — "As matters stand to-day in British East Africa, the big game of the country outside the three preserves is absolutely certain to disappear in about one-fourth the time that it took South Africa to accomplish the same result."

A herd of giraffe. "The bag limit...is ruinously extravagant...It is awful to think that for a petty sum [$250] any man may buy the right to kill 300 head of hoofed and horned animals of 44 species, not counting the carnivorous animals that also may be killed. That bag limit should immediately be reduced 75 per cent"

Very large lion shot by Dr. Rainsford

only of small size in the region of the Tana, also in the Serengeti Plains between Voi and Kilimanjaro, as also in the country south and east of Lake Rudolf and in that about Mt. Kenia.

After much study of the question, the Nzoia Plateau especially the Cheringani Hills at its eastern part was chosen as the hunting ground, a small area, about one hundred miles by seventy in extent and some one hundred and fifty miles from the railroad. This choice of territory fortunately gave us as companions and guides, the warriors of a little tribe there, the Cheringani Dorobo.

A well built Dorobo

In 1908 I had made friends with this small tribe of poison-hunters. Secure in the fastnesses of their dense woodlands, they had controlled the land for ages. Fear of the deadly poison of their arrows and the cunning secrecy of their deep-spiked game-pits had kept off the hunting safari; while the uncertain attitude toward the white men, maintained until quite lately by their neighbors, the Elgeyo tribe on the south and the Maraquette on the north, had closed the door effectually in that whole countryside to every expedition other than a military one. These very shy natives now agreed to come down from their mountain villages and serve the new expedition. Half a dozen real trackers were soon picked out among them. Three abreast where the ground was open they would follow the spoor at a fast walk, and interpreting the rhino's brainless wanderings — signs which even to the safari leader's experienced eyes were invisible — would gain knowledge as to where the game was going and where it would rest.

The forest was so dense at times that we used some forty or fifty natives as signallers and beaters. The method took time to organize but worked well. The Cheringani were cautious when following rhino. It is very easy to shoot this animal in the open. In dense cover it is another matter, and beaters and trackers I must confess, spent much time safely if not usefully up trees. When on the trail of buffalo, which also are easily shot in open country, only a few of the bravest would go into the black hollows that hid the beasts, and once a buffalo was wounded I had to go in with them or no one would go. Good fortune attended us however and in all the history of the expedition no one of the hundred and fifty men was seriously injured. The risk of hunting buffalo in wooded country is sadly proved, if proof were necessary, by the later fate of the very best of the natives I employed. He was a brave boy and wonderfully good as a tracker. After

our expedition left the country another party hearing of its success secured the guidance of these Cheringani. This young native acted as gun-bearer and was killed by one of the first buffalo shot at.

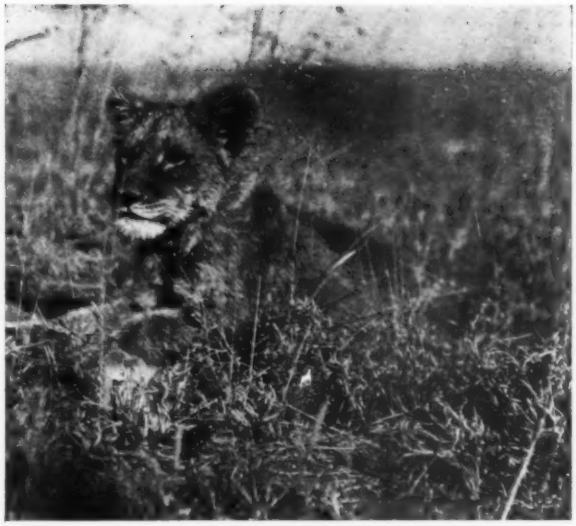
When the tracking led to success and an animal was killed, the expedition

Hard work with our wagon. Deep ravines and swamp-edged streams made necessary considerable bridging and road-making

made camp and remained on the spot until the heavy skin was thoroughly cared for. Mr. Jenness Richardson, the taxidermist of the expedition, was indefatigable and also trained many of the natives — some to unusual skill — in the work of preparing skins and caring for the skeletons.

One of the great difficulties of the expedition was transportation of its

large and heavy supplies through the country of the Cheringani. This country has forests unusual for East Africa. The altitude ranges from a little over 4000 feet above sea level in some of the lower parts to 10,500 feet where dense woodlands cover the summits of the hills. Impassible ravines and deep swamp-edged narrow streams were met with everywhere and made necessary considerable digging and rough bridging and road-making.



One-year-old lion

Our usual method of transportation was by ox team. Sometimes as many as thirty-two oxen were put in the iron chain that hauled our wagon. Almost two tons of fine salt were necessary for the preparation of the skins. A large tent in which many men could work on the skins had to be carried; also a great weight of *posho*, the natives' food of ground meal. Our consumption of this was about two hundred pounds each day. *Posho*, as all well know who have left civilization far behind in African lands, is the cause of the chief difficulty of all explorers. It may be impossible to procure, once off the main lines of travel, and must be had not at intervals but always. The breaking up and ruin of expeditions is often due to

Chita cubs. The chita or hunting leopard differs from all others of the cat family in the lack of retractile claws. It hunts antelope, reedbuck and kudu, stalking the prey with stealth and cunning preliminary to a lightning-like rush. For a considerable distance it can outstrip the swiftest antelope

The expedition halted under a thorn tree ninety yards in diameter

the failure to provide *posho*. In British East Africa government land regulations require that each porter engaged receive regularly his pound and a half of ground meal a day. Failing that, he has a grievance against his employer that frees him from any obligation to serve. Now one hundred men eat 150 pounds a day, i.e., 4500 pounds a month, or 27,000 pounds in six months. In our case we had been obliged to carry all this over one hundred and fifty miles on men's heads or by donkeys before it was available.

To keep the expedition in food I hired a small herd of donkeys (a donkey-load is 120 pounds) and kept it constantly traveling between depots in the

We were obliged to transport the supplies and equipment of the expedition one hundred and fifty miles from the railroad to the Nzoia Plateau

hills and the lower country under the guidance of capable and trustworthy natives. This plan as a rule worked well, but often the camp was denuded of all porters for days together, in order to keep up the ration supply.

How the Cheringani have preserved their tribal life (they only number a few hundreds) is a mystery. Perhaps their preservation is chiefly owing to two things: their poverty and their poison. They are not, or have not been, owners of herds, and not to own herds in Africa is at least to avoid

Bull buffalo head. The expedition had been given government permission to shoot three buffalo for a group in the Museum

having to pay heavy insurance risks. Four-fifths of the fighting done between tribe and tribe has been about cattle. Until the English came, the very existence of the cattle-owning people had been altogether dependent on its organization for war as among the Masai, or on its possession of a country in which the herds could be hidden or defended from the powerful cattle-raider. The Masai for instance, the great cattle-owning tribe, have for the first article of the tribal creed, "In the beginning God gave all cattle to

These poison-hunters had unusual ability in interpreting and following the rhino's wanderings

the Masai." Hence the natural and inevitable corollary, "The Masai have a right to any man's cattle."

In their poison the Cheringani have a very terrible weapon and they are extraordinary in the suddenness of their movements. The making of the poison is a guarded secret. After some months they were willing to show me the tree it was brewed from, but as to the details of its production they were persistently silent. As in the poison-making of other lands, certain complicated rules must be obeyed and customs followed. The poison-maker must leave his hut and his women-folk for weeks or longer. He must live quite alone and work alone. So much I learned. The poison loses strength by keeping, so much they admit. I am inclined to think this loss is rapid.

The Cheringani trade the poison made by them to the surrounding tribes. The Nandi, their neighbors on the other side of the Nzoia

Black rhinoceros head. The main aim of the expedition was to procure material for a black rhinoceros group in the American Museum

Plateau, used it in their war with the Government a few years ago and several soldiers in the King's African Rifles were struck by poisoned arrows. When men were wounded, the doctors told me, the poison seemed to affect the heart but yielded to arsenic and the wounded did not die. From what I have seen, one struck by poisoned arrows such as the Cheringani make— if the poison be freshly brewed — cannot fail to die almost instantly.

Capturing a viverrine cat alive

The unhunted region of the Cheringani range was chosen for the work of the expedition at the advice of Mr. Woosman, Chief Game Ranger of British East Africa, whose great ability and experience gives his judgment value. The success of the expedition must be largely credited to the work of the trackers chosen from the wildmen of the Cheringani Dorobo. They had had little experience hunting with white men previously but nevertheless gave us their steady coöperation. I have had in past years considerable experience of trackers and tracking but never before in Africa have I seen work done comparable with that of the trackers of the Cheringani.

Silver-haired pig of the African forest. This is a species rarely captured and more rarely photographed

Photo by E. O. Hovey, 1911

VIEW IN THE SECOND FOREST

The so-called "fossil forest" of Arizona is not a forest at all nor is there any evidence that the trees grew on the spot where they are now found. They were probably drifted by stream action into the present locality where they became buried under accumulations of sand. The logs belong to a cone-bearing tree (*Araucarioxylon arizonicum*) which no longer grows in the northern hemisphere. On June 8, 1906, by proclamation of President Roosevelt, the region of the fossil forest was set aside permanently as a public park

THE "FOSSIL FOREST" OF ARIZONA

By George P. Merrill

Head Curator of Geology, United States National Museum

THE so-called "fossil forest"[1] of Arizona lies some six miles south of Adamana, a station on the Santa Fé Railroad, in Apache County. The expression "so-called" is used for the reason that it is not a forest at all, nor does it bear any resemblance to one, being rather a collection of silicified logs. Could one imagine a collection of saw logs ponded back in a boom and waiting their turn at the mill, and that further this collection had become water-logged, sunken and buried by sediments, he would gain a very fair idea of the conditions which apparently at one time prevailed during the history of the region. There is nothing to indicate that the trees even grew near the locality where the logs are now found. It is apparent rather that they grew at some distant point and were drifted by stream action into eddies after having been reduced to mere trunks or logs through the loss of their leaves and smaller limbs. Here, in various stages of decay, they sank and became buried by the accumulations of sand and gravel and subsequently silicified. Nor are the logs now, with few exceptions, even in the position of their original entombment. The beds in which they once lay have been cut through by erosion and the logs settled, or rolled down to a lower level. In this process they became more broken and under alternations of blistering heat and freezing cold have been splintered and chipped, oxidized and polished, until the country for an area of many square miles is covered with a bewildering array of broken trunks and fragments of agate and jasper, varying from nearly colorless through yellow and red to the most brilliant carnelian. The few logs which remain in the position of their original entombment are widely scattered and the one best known to the tourist is that forming the so-called "natural bridge," where an enormous log has been undermined by the action of temporary streams and remains supported at both ends spanning a chasm of nearly fifty feet in width and twenty or more feet in depth.

It is apparent that there were at least four eddies in which the logs accumulated in the area now comprised within the reservation known as the Petrified Forest National Monument of Arizona. The first lies some six

[1] Note.— The area of the Petrified Forest is well represented in a map issued by the United States Geological Survey. The map published in December, 1912, is the result of a survey made two years previously and shows the location and topography of the six separate forests. The trees are perhaps millions of years old and consist to-day of many-colored agate, an exceedingly hard and tough stone. Visitors to the American Museum can see many interesting specimens from the Petrified Forest. In the gem room are several particularly fine polished slabs of agatized wood from near Adamana and in the mineral collection is a two-foot section of agatized log from the same region. In the corridor on the ground floor leading to the building-stone collection is a considerable series of specimens illustrating the several phases of growth and fossilization collected by Dr. E. O. Hovey under special permit from the Department of the Interior.

Photo by E. O. Hovey, 1911

General view in the third forest.— The fossil forest of Arizona shows a natural division into separate so-called "forests." The photograph presents a general view in the third forest quite typical of the whole region

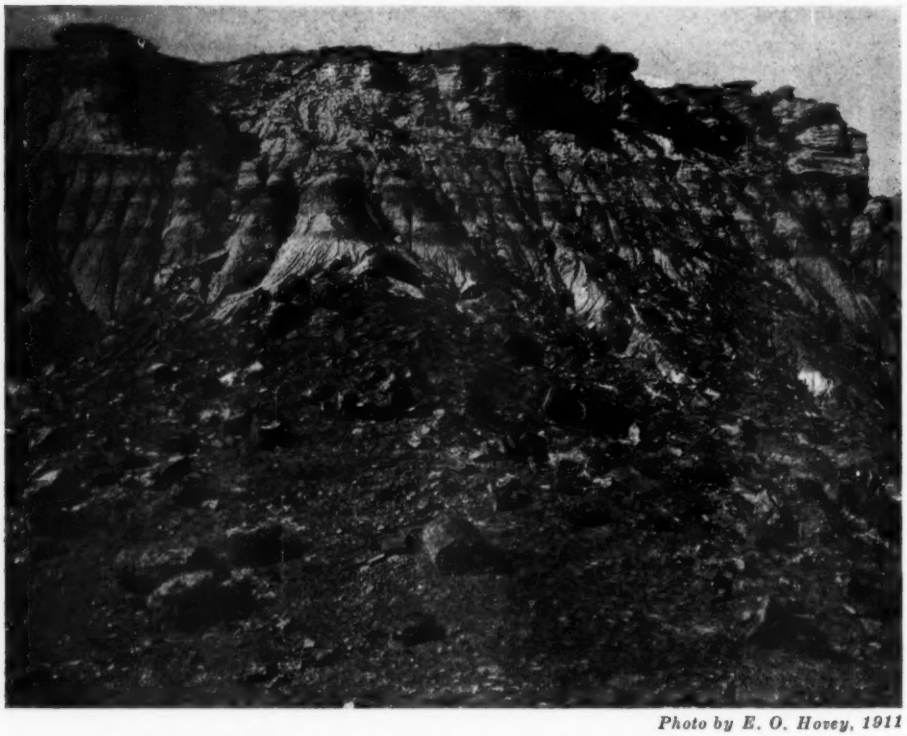


Photo by E. O. Hovey, 1911

In the first forest.— The silicified logs have rolled down from the upper sandstone layer under the influence of wind and water erosion of the rock containing them

miles south of Adamana. This area includes the natural bridge already referred to, and a considerable collection of broken trunks which, while interesting and instructive, cannot compare in point of beauty or size with the second, third and Rainbow forests further to the south and southwest. Both the second and third have suffered less through erosion than the first and the logs are less broken, and it is here that one gains the best impression of the enormous dimensions of these silicified monsters. Trunks occur of all sizes up to five feet or more in diameter and sixty or eighty or even a

Photo by E. O. Hovey, 1911

Spectacular effect of erosion in the first forest.—The lower portion shows clays of many colors and on the ground at the base are broken logs of petrified wood. An osprey has built its nest on the pinnacle of sandstone

hundred feet in length. Of all the deposits, that known as the Rainbow Forest is the most fascinating on account of the richness of the colors, although from a geological standpoint it is a wreck. Few if any of the trees occupy their original position of entombment, but all are tumbled about in a confused, chaotic manner, in the numerous gulches and ravines which result from the spasmodic periods of erosion characteristic of arid regions.

It is to be regretted that the average tourist, who devotes season after season to European travel, does not feel that he can devote more than a portion of a single day to the investigation of these wonderful deposits of

his own country. This necessarily limits him to the first, or possibly to the first and second forests. One should devote at least two days to them, passing the first day through the first and second forests and arriving at the third in season to camp at the one water hole within the entire area. The forenoon of the second day can well be given up to exploring the third and Rainbow forests, and the afternoon to the return to Adamana. Such a trip involves no hardship. Camping at the altitude of 5000 feet in the dry atmosphere is simply exhilarating and the small supply of food and water needed can readily be carried with the outfit which is furnished by the superintendent at Adamana.

The geology of this area was first worked out in detail by the late Professor Lester F. Ward, then connected with the United States Geological Survey. He described the region as consisting of the ruins of a former plain having an altitude above sea level of something like 5700 feet. This has now undergone erosion to a maximum depth of nearly 700 feet and is cut into innumerable ridges, buttes and small mesas with valleys, gorges and gulches between. The rock formations consist of nearly horizontal, alternating beds of purple, white and bluish marls, sandstones and shales, giving a lively and pleasing effect such as is characteristic of so many of the landscapes of the state. The beds in which the logs were entombed were deposited at the bottom of a Mesozoic sea, where they remained until Tertiary times when the entire country was raised from five to six thousand feet above sea level. The logs throughout the area belong to a cone-bearing tree, of a single species, described by Dr. F. H. Knowlton of the United States Geological Survey under the name of *Araucarioxylon arizonicum*, a tree no longer found in the northern hemisphere, its nearest representative being a small cultivated form known as the Norfolk Island pine.

As to how the trunks became petrified or silicified we are still somewhat in the dark. Silica is ordinarily one of the most insoluble substances, but nevertheless readily soluble in an alkaline solution — that is, one containing soda or potash. It is probable that the solutions permeating through these beds were of this nature and as the logs gradually decayed their organic matter was replaced, molecule by molecule, by silica. The wood is therefore not "turned to stone," but has simply been replaced by mineral matter, mainly silica. The brilliant red and other colors are due to the small amounts of iron and manganese deposited together with the silica, and super-oxidation as the trunks are exposed to the air. The more brilliant colors are therefore to be found in the small chips lying on or near the surface.

Prior to 1906 these forests were on government and railroad lands and subject to the vandalism of curiosity seekers and those commercially inclined. At one time a considerable industry was carried on in cut and polished sections of the sounder and more highly colored varieties, and

Photo by E. O. Hovey, 1911

Natural bridge, seen from above.— The log best known to the tourist is the one in the first forest, forming the so-called "natural bridge". This log remains in the position of its original entombment but has been undermined by water until it is supported at the two ends only over a chasm fifty feet wide and twenty feet deep

Photo by E. O. Hovey, 1911

View of natural bridge from below.— The bridge has recently been reënforced by artificial stone piers

Photo by E. O. Hovey, 1911

Scene about eight miles east of Adamana.— The ground is covered with chips broken off from the logs by Indians in making arrow points. Hammers of agatized wood were used in chipping the logs

Photo by E. O. Hovey, 1911

Only a few of the fossil trees remain intact.— The greater number cover the ground in a bewildering array of broken trunks and fragments

visitors to the numerous expositions of late years will probably remember the striking examples shown by a firm with headquarters at Sioux Falls, South Dakota. Fortunately the matter attracted the attention of public-spirited men and in 1895 the territorial legislature of Arizona memorialized Congress, calling attention to the region and asking that the area be set aside as a national park. This was done after investigation by the Land Office and the Geological Survey, and a proclamation by President Roosevelt issued June 8, 1906, set it aside permanently as a public wonderland and playground. Subsequently in 1911, the area was resurveyed and reduced in size and a new proclamation issued by President Taft.

In order to preserve the forest indefinitely visitors are prohibited from breaking or injuring the logs in any way, although permitted to carry away a few pounds of chips picked up from areas set aside for the purpose.

MUSEUM COÖPERATION IN THE TEACHING OF SCHOOL HYGIENE AND SANITATION

By C.-E. A. Winslow

Address before the Fourth International Congress of School Hygiene at Buffalo, August, 1913

ALL of us in attendance at this Congress are probably convinced that the science of life and health is the one thing which should be taught in the public schools whatever else may be neglected. I know however that there are many who are quite as insistent on the importance of grammar or arithmetic or history, drawing or French, carpentry or cooking or basket work; and the result is that many school boards shut their ears to us all alike. Nevertheless, I am ready to brave the obvious reproach of being merely another faddist by urging that the principles of biology and public health should occupy a truly central place in the curriculum of elementary and secondary schools, and I believe that the things for which such a Congress as this stands are not the idiosyncrasy of a few enthusiasts but, if properly presented, have behind them an overwhelming force of public opinion.

It is an obvious truism that education is meant to prepare for living; and it seems clear that the most general and fundamental phases of the art of life should receive proportionate representation in the preparatory process. The average man uses his history once a day perhaps, his arithmetic somewhat oftener. Even his English grammar is on trial during a part of his working hours only, and his whole mental equipment is put by for a third of the twenty-four. He is *living* all the time however, and is either well or ill, happy or miserable, efficient or useless, largely as a result of the conduct and management of the delicate physical machine which is in his charge. He may be innocent of historic fact, of the multiplication table and of syntax, and yet be a useful and contented citizen. He cannot be either long without observing the laws of hygiene and sanitation. I fancy that any one with a child of his own will have no doubt that knowledge of what to eat and what not to eat and why, of the meaning and importance of fresh air, of the claims of exercise and rest, of the essential routine of body cleanliness, of how germ diseases spread and how they may be controlled, of the methods of rendering water and milk safe and the reasons therefor, of the dangers of insect-borne disease and of the essentials of public sanitation — are of even greater moment than those things which prepare for the intellectual and social life.

There might be two reasons for the comparative neglect of this transcendently important subject, a neglect which still persists in spite of the encouraging development of recent years. It might be claimed that although it is desirable to keep healthy we have no body of knowledge which will enable us to do so. This was undoubtedly true in the past and is historically the reason why biology and public health have occupied so obscure a place in the curriculum. It is not true any longer. We have to-day a large number of principles and applications which enable us to keep the bodily machine in the best working order and to guard it against the insidious attacks of communicable disease. Or on the other hand, it might be held that, although essential and available, knowledge of how to live a healthy life could better be obtained in the home than in the school. It is obvious that this claim is wholly untenable, not only for the teeming populations of the tenements who come often from other countries with sanitary conditions of a lower grade than ours, but even for many of the most enlightened households, since in a subject growing so rapidly as

sanitary science, knowledge ten or twenty years old is almost as good as none. There is no other single thing which the child needs so much to know as how to keep well. The knowledge which is essential is available; and it can be transmitted only by the school.

The high schools in New York City have seen this need and this opportunity and have done much toward meeting it. In almost all of them the practical aspects of biology occupy an important place and in many of them, like the DeWitt Clinton High School and the Morris High School, the broader aspects of sanitation are well taught under the head of civic biology, while the larger girls' schools, the Washington Irving and Wadleigh High School, have developed exceedingly promising courses in home sanitation as well.

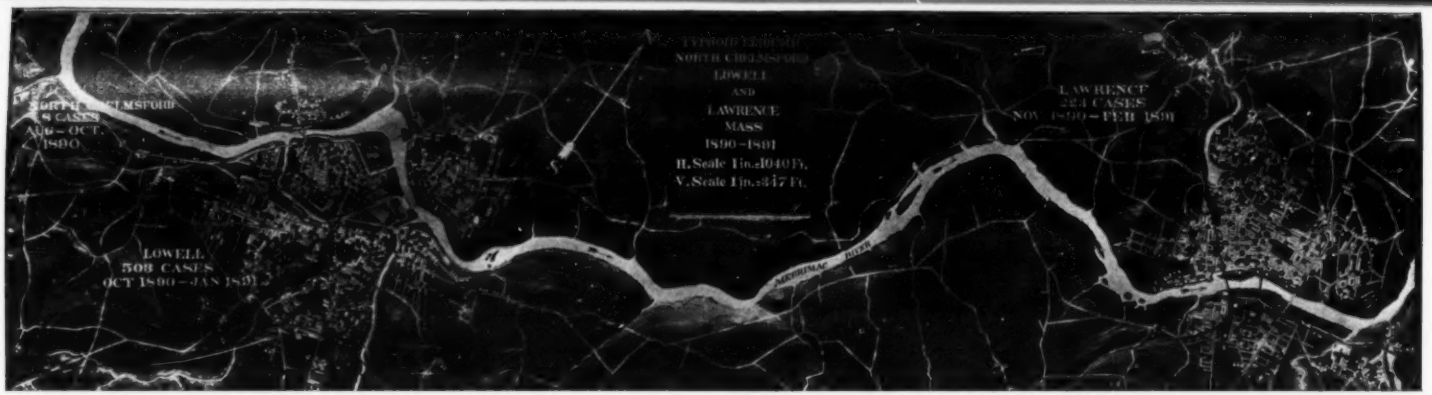
In this work there seemed to be an opportunity for coöperation between the newly organized department of public health of the American Museum of Natural History and the public schools of New York; and it is of this coöperation that I wish to speak very briefly to-day.

The existence of a department of public health in a natural history museum deserves a word of explanation by the way, for it is, so far as I am aware, a unique circumstance. The American Museum is, I think, the first institution of its kind to grasp the opportunity of attacking the educational problem of public health by the use of museum methods. This development is really however, a natural, almost an inevitable one. Man is an animal and public health is one of the most important phases of his natural history. He is knit up with other animals and plants in a complex chain of interrelationships, beneficent and malign. The plants and animals which serve him for food, the microbes which cause some of his deadliest diseases, the insects and other animals which serve as intermediate hosts, and those which prey upon them in turn, all affect him and act as determining factors in the fate of nations and the progress of civilization. They are as much parts of natural history, broadly interpreted, as habitat groups of birds or preparations illustrating the relations of insects to the plants or other insects upon which they feed. To show these things in graphic form by actual specimens, by models and by diagrams, is the task of a department of health in a natural history museum and it is a task which no other agency is so well fitted to accomplish.

In the hall of public health of the American Museum we have now, after three years' work, installed three fairly complete series of exhibits dealing with water supply and public health, with the disposal of city wastes and with bacteria, while a fourth series, illustrating the relation of insects to disease is well under way. The water supply series begins with the rainfall and shows by models, diagrams and relief maps how the amount and frequency of rain varies over the continental United States. The physical characters of waters are illustrated by samples of a highly colored water from the Dismal Swamp, of a hard well water from Iowa, of a turbid water from the Ohio River and the like. Glass models show the principal micro-organisms, the algæ, diatoms and protozoa, which cause tastes and odors in water-supplies. The danger from polluted water is illustrated by relief maps of famous water-borne epidemics at Lausen, Switzerland, and in the Merrimac Valley. Methods of purifying water, by storage, filtration and disinfection are made clear by models, and finally the results of water purification are set forth in a series of diagrams.

The models dealing with the disposal of city wastes include local illustrations of pollution of shellfish, floating baths and other dangers of the harbor waters of New York and a detailed presentation of the methods of treating city sewage by screening, sedimentation, filtration and disinfection.

The bacterial exhibit consists of a series of glass models of the principal disease bacteria, 25,000 times natural size and of photomicrographs illustrating their relative



BACTERIA AND DISEASE.— Most of the bacteria are harmless and some are useful to man. A few of them however are adapted to life in the human body and when they grow in the body the chemical changes they produce poison the body and cause disease. One of these disease bacteria is the germ of typhoid fever which is often spread to large numbers of people in polluted water and milk. The photograph shows how such an epidemic occurred in the Merrimac River [valley in 1890. From August to October there were 8 cases of typhoid fever in the little village of North Chelmsford [at extreme left on map],.... 503 cases of typhoid fever followed between October and January in Lowell [4 miles below on the Merrimac River].... and 223 cases followed between November and February in Lawrence [9 miles farther down the river]. *Quoted from American Museum School Chart*

THE HOUSE-FLY.— At the left, fly larvæ and pupæ in old papers; at the right, fly larvæ in stable manure. The house-fly (better called the filth-fly) does not bite and is not the sole cause of any disease as mosquitoes are the sole cause of malaria and yellow fever. It often carries filth to food however, on its feet or body, and in this way may spread diseases like typhoid fever. The fly lays its eggs in horse manure or some other decaying substance and from the eggs white worm-like larvæ hatch out. These larvæ form brown oval pupæ which hatch out the adult at a period of about ten or twelve days from the time the eggs were laid. *Quoted from American Museum School Chart*

size and shape, and of actual colonies of many types of useful and harmful bacteria showing how mass cultures of the microbes look to the naked eye.

The relation of insects to disease is a particularly fruitful field for museum work and is the one upon which we are chiefly engaged at the present time. The American Museum already has in its department of invertebrate zoölogy wonderful enlarged models of mosquitoes and the department of public health has just installed a model of the house-fly, enlarged forty diameters, which took its skilled artist-modeler, Mr. Ignaz Matausch, nearly a year to complete. A wide series of facts bearing on the life history of the fly are illustrated as well as the relation of the fly to disease, the practical methods for its control and the results achieved thereby. A similar, but more enlarged model of the flea (carrier of bubonic plague) is now under preparation and we have already installed models, some small and some life size, dealing with the rats which harbor the plague microbe and from which the flea carries it to man. The opportunity for future development here, and in connection with the mosquitoes of malaria and yellow fever, and a score of other disease-carriers, is a tempting one which we hope to develop in the next few years.

How Disease is Prevented...Pasteurizing means heating the milk to 150°–160° F. for 20 minutes. This does not injure the milk...but kills all the germs of disease...Impure water can be purified...by boiling it. *Quoted from American Museum School Chart*

This hall is our first opportunity to serve the public schools in their work of health education. They bring their classes to the Museum in one of the periods allotted to civic biology and in an hour with these models and diagrams learn more than they could get from books and lectures in a month.

In addition to the hall, which is open to all the visitors to the Museum (numbering eight hundred thousand a year), we arrange special lectures to the school children on the occasion of their visits. It is the policy of the Museum to provide lectures (generally illustrated) on any subject within its field for any teacher who may ask it and for any number of pupils, from a score to a thousand. Or, if the teacher prefers to give the lecture himself, we provide hall, lantern slides and operator. The larger high schools send their classes twice a year near the end of each term for a talk on water or milk, or insect-borne disease, city-cleaning or some other topic which fits into the course of study at the time.

New York is a large city however, and the children from many of the schools can come to the Museum only a few times a year. It was necessary to get our illustrative material into the schools themselves if it was really to be effective. For some time the American Museum has taken an active part in the nature study work of the public schools by circulating loan collections of birds, insects, mollusks, sponges, corals, woods, minerals and the like. Over 500 of these cabinets circulated in 491 schools in 1912 reaching 1,275,890 children. Of this work President Osborn of the Museum has said, "Step by step a great system of coöperation has been built up between the regular course work in the schools and the visual instruction in the Museum,

until the city of New York now affords the most brilliant example in the world of extension to the school system of all the resources of a great museum."

Here then was our example; and at the instance of some of the high school teachers most active in civic biology we have attempted to apply the same plan to public health extension work.

Our first attempt was in the form of an album of large photographs dealing with the spread and prevention of communicable disease. These were mounted on cardboard panels twenty inches wide by thirty inches long, from one to four photographs being borne on each panel. The first panel shows four of the more important pathogenic germs with the text:

> Many sicknesses, and particularly those which are catching or contagious, are caused by little living germs which grow in the body as a mold grows in jelly and make poisons that cause sickness and sometimes death. These germs are harmless-looking things like microscopic sausages, so small that millions might lodge on a pin point; yet they are the cause of tuberculosis and diphtheria, typhoid fever and cholera and many other diseases.

The second panel illustrates the sources of the disease germs, the sick person and the carrier [a patient in bed and a rather rough-looking individual carrying a milk bottle by the top in each hand]. The next panels show how disease is spread — by water [with a map of the famous Lowell epidemic]; by milk [a dirty cow barn]; by shellfish, by flies, by bathing in polluted water, and by contact. For the latter subject we posed and photographed children who came to visit the children's room at the Museum. In one, two little girls are doing sums with a common pencil. The legend points out that

> These little girls are doing sums with one pencil, which each in turn without thinking puts in her mouth. Whatever germs are in the mouths will be well mixed and any disease which either child has will be likely to spread to the other.

In another panel one boy coughs in his hand and then with the same hand gives an apple to another boy who in the third picture eats it. Another panel shows two children waiting for a drink from a common drinking cup used by a larger companion. Next there follow a series of panels showing how such communicable diseases are prevented. One illustrates how milk may be pasteurized in the home. Another shows how to make a drinking cup by folding a square of paper. A table set for breakfast and a picture of a child washing her hands over a basin furnish texts for a discussion of the importance of using individual utensils and of personal cleanliness. Finally the series closes with pictures of an open sleeping-room window and of an outdoor gymnasium with the following legends:

> Not all persons who get disease germs come down with disease. If the body is strong and well it can often defend itself against its tiny enemies. One way to keep well is to have plenty of air in all sleeping rooms. Windows should be open at the bottom to let cool fresh air in and at the top to let the hot bad air out. In winter a screen of cheesecloth may be made for the bottom opening to prevent uncomfortable drafts.
>
> In the daytime the best way to keep well and able to resist disease is to stay out of doors in the fresh air and sunlight and strengthen the body by wholesome games.

A second album, deals more specifically with the bacteria and their relation to the life of man. The first panel in this series again shows certain typical bacterial forms. The next four illustrate the relation of bacteria to disease by means of maps and diagrams of water-borne epidemics, typhoid fever and cholera, and of milk-borne epidemics, diphtheria and tonsilitis. The sixth deals with the relation of bacteria to decomposition and the practical method of controlling putrefactive processes, illustrated by a view taken in a canning factory. The seventh photograph, of flax-

retting in the river Lys in Belgium, furnishes the text for a discussion of the use of microbes in the arts and industries. The eighth and last illustrates the effect of soil-inoculation with nitrogen-fixing bacteria by two samples of pea plants grown in poor soil, with and without microbic aid.

This album is accompanied by a case of bacterial cultures showing how the bacteria appear in mass growths and how we detect them in water, milk and air. The cultures are mounted on flat wooden backs about twelve inches by fourteen inches with braces so that they can be stood up on the teacher's desk. Each case holds three of these stands which fit neatly into a box easily carried by hand. The first stand bears a series of streak cultures showing the form and color of the surface growth of half a dozen striking species and illustrating the production of gas and acid in sugar media by bacteria, the coagulation of milk, and the destruction of a piece of meat by putrefactive forms. The second stand bears two plates showing colonies developed from a comparable portion of a good and a bad water and two plates showing colonies developed from a raw and a pasteurized milk and one showing colonies developed from germs deposited by the feet of a fly in walking across the plate. The third stand bears five sterile agar plates which may be opened and infected in the classroom with dust, saliva, finger prints or the like in order to show the children the resulting growth.

The third of our traveling exhibits deals with insect-borne disease. In the album the various life stages of the mosquito — egg, larva, pupa and adult — are shown with photographs making clear, for the larva and adult, the differences between *Culex* and *Anopheles*. The control of these pests is illustrated by photographs of a swamp in New Jersey before and after drainage, by a picture of a mosquito squad oiling catch basins and by one of Mr. W. L. Underwood's remarkable photographs of a goldfish eating larvæ. A diagram of the elimination of yellow fever in Havana, shows what may be accomplished by mosquito control in tropical sanitation. In a similar way are shown the life stages of the house-fly and its breeding places (a dirty stable and a back-yard dump). An efficient fly trap is illustrated and briefly explained and the importance of cleanliness in doing away with fly breeding is indicated by a series of photographs of the way in which garbage is cared for in the city of Minneapolis. The sanitary importance of fly-fighting in the South is emphasized by a diagram of the recent reduction of the typhoid death rate in Jacksonville. The album closes with large photographs of the louse and the flea as carriers of typhus and bubonic plague.

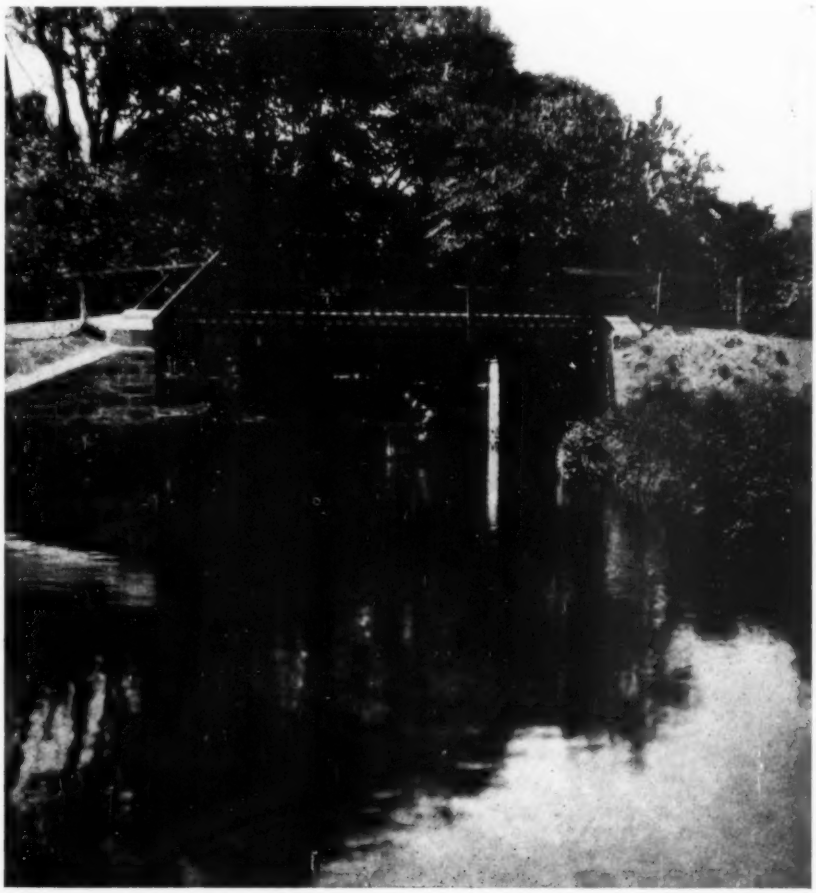
This album is accompanied by a series of vials in which actual specimens of the four life stages of the fly and of the *Culex* and *Anopheles* mosquitoes are mounted in glycerine-agar so that the pupil may study them for himself and learn to recognize them in the back yards and pools near his own home.

All this is of course only a beginning of what we may hope to do, even for the high schools. We have as yet scarcely touched the great underlying problem of the elementary schools where it is most vital that a sound basis should be laid for healthy living and where at present (in New York City) fifteen minutes a week is the maximum time that can be spared for theoretical instruction in hygiene. We do feel however that we have done enough to show that museum methods of instruction may be made of use in the teaching of school hygiene and sanitation. President Osborn of the American Museum, in speaking of its general educational work has said, "Already the child can see here what Aristotle dreamt of but never saw, and what Darwin and Huxley put into prophecy but did not live to see." So in our special field we may teach the child the causes of diseases which were mysteries to Pasteur and Koch. We have the opportunity to spread through the great school population of New York a knowledge of the laws of health such as Hygeia never vouchsafed to any of her devotees in any other age than ours.

SEA LAMPREYS AND THEIR NESTS

By Louis Hussakof

THERE has recently been placed on exhibition in the hall of fishes a group representing the nesting habits of the sea lamprey, the largest, and in some regards the most remarkable, of all the lampreys. The group represents three large lampreys building a nest among the pebbles at the bottom of a clear, shallow stream, close to the bank and partly under a half-submerged log. The studies for the group were made



The Nissequague River at Smithtown, Long Island, where the studies on the nesting habits of the sea lamprey were made. A large nest was found among the pebbles directly under the bridge

on the Nissequague River at Smithtown, Long Island, and the group is a faithful representation of the scene as it occurs in nature.

Lampreys are among the most remarkable creatures of our waters, both for their extraordinary nesting habits and their anatomical structure, which is of great importance in the study of the lower vertebrates. Although eel-like in appearance, they are not eels; in fact they are not even fishes, in the strict sense of the word. They lack paired fins — the fins which correspond to the arms and legs of higher vertebrates — and they have a suctorial mouth which is of quite different structure from that of fishes. For these reasons and for others of a more technical kind, lampreys, together with their allies the "hags", are separated from the true fishes as a distinct class, the Cyclostomata (in allusion to the round mouth).

There are four or five species of lampreys inhabiting the lakes and streams of the northern hemisphere, and one occurs in the sea. The latter is found on the coasts of both Europe and America, and is the largest of all the lampreys, reaching a length of nearly three feet.

In the spring sea lampreys enter fresh water in order to spawn. A clear, shallow stream with a pebbly bottom is usually selected, and here they build their "nests" — circular depressions in the river bottom about three feet across and a few inches deep at the center. Two or more lampreys are usually engaged in building a single nest, and their behavior is most extraordinary. John Burroughs characterized it as "one of the most curious spectacles" he had ever seen in our streams.

The rooting up and transporting of the pebbles to make the nest is done entirely with the mouth, the tail not being used to fan it into shape as is the case with certain fishes, such as the sunfish or the black bass. The lamprey seizes a pebble or a stone with its suctorial mouth, lifts it from the bottom, turns in a graceful curve and carries it out of the nest; and then immediately returns for a second pebble. Sometimes instead of carrying the pebble out, it charges head-on against it and pushes it up the incline and out of the nest. It is surprising how large a stone a lamprey will thus transport; I have picked up half a brick as it was released by a lamprey after being tugged out of the nest.

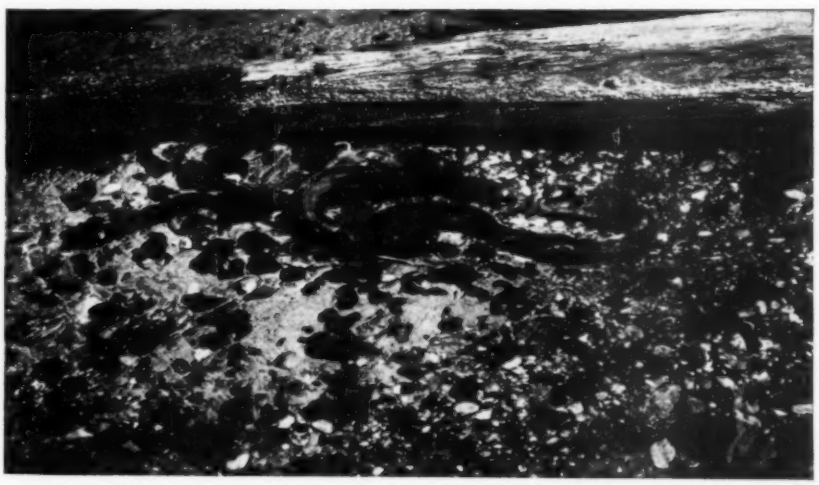
The eggs are scattered broadcast over the nest. They are very small (about $\frac{1}{24}$ of an inch in diameter), pear-shaped, and so much like sand grains

The sea lamprey is not an eel, and in fact, not really a fish. Together with the closely related "hags," it belongs to a distinct class — the Cyclostomata (in allusion to the round sucking mouth)

in color that it takes a trained eye to discover them. They hatch in about a fortnight, long after the nest has been deserted and scattered by the flow of the river. The larvæ differ greatly from the adults; so much, in fact, that they were once thought to be a distinct species, which was named ammocœtes.

The ammocœtes lie in burrows in the sand, feeding on microörganisms. They live thus for three or four years before they metamorphose into lampreys. The external changes in this process consist in the development of eyes, modifications in the form of the mouth, gills and of several other organs. Internally the transformation is no less profound. When the metamorphosis is completed, the lampreys migrate to the sea. Here they live three to four years — the exact period has not been definitely ascertained — until they reach maturity and are ready to run up streams for the purpose of spawning.

After spawning the lampreys, it appears, die, none of them returning again to the sea. One may often encounter dead lampreys tangled in the tall grass here and there along the river bank, where they had crept in to die. There are several causes for their death after spawning, the most important one perhaps being, that they are attacked by microörganisms through the wounds which they have inflicted upon each other with their rasping teeth while on the nest, and that in their weakened condition due to the labor of tugging and transporting stones, they are unable to resist the inroads of the disease and therefore soon succumb.



Three lampreys engaged in building a nest. They root up and transfer the pebbles, thus forming a circular depression some three feet across and a few inches deep. Photograph of living lampreys on the bottom of the Nissequague River. The new group in the American Museum is a faithful reproduction of this scene

MUSEUM NOTES

SINCE the last issue of the JOURNAL the following persons have been elected to membership in the Museum:

Patron, MR. PAUL J. RAINEY;

Fellow, MR. EMERSON MACMILLIN;

Life Members, DR. PERCIVAL LOWELL and MESSRS. STANLEY DOTY BROWN, RUSSELL HASTINGS MILLWARD and EDWARD C. PARISH;

Annual Members, MRS. F. SCHNIEWIND, MISSES MARY L. JOBE and JOSEPHINE M. WEIL, DR. G. L. ROHDENBURG, Prof. WILLIAM M. SLOANE and MESSRS. JAMES ARTHUR, JEROME J. HANAUER, HUBERT A. JUDGE, ROBERT MCGREGOR, GEORGE OBERDORFER and JAMES SPEAR.

UNDER the title "My Oceanographical Cruises," His Serene Highness, the Prince of Monaco spoke before the members of the American Museum and of the New York Academy of Sciences in the Auditorium of the Museum on the evening of October 27. He briefly reviewed his work of the past twenty-five years, from the time he began in a small schooner manned by two sturdy sailors, down to his work on the "Hirondelle" a twin-screw steamer of 1600 tons, carrying a staff of trained scientists, provided with laboratories and equipped with every device not only for studying the profoundest depths of the ocean, but also for capturing the fishes and cetaceans at the surface and exploring the air for miles above.

With the aid of slides and motion pictures the Prince described the methods by which the air currents are studied, the conditions of moisture and temperature being registered by instruments raised by twin balloons so prepared that eventually one bursts, the other dragged downward by the weight of the apparatus, marking the spot where it floated. The methods were illustrated of making deep-sea soundings, securing samples of the sea bottom at a depth of two or three miles and at the same time obtaining records of the temperature and samples of the water at various levels. The lecture concluded with an account of the denizens of the deep sea and the methods by which they are secured. In this branch of work the Prince of Monaco has been particularly successful, obtaining by cunningly devised nets and traps hundreds of specimens where others have secured but two or three.

DR. BRUNO OETTEKING, who has received training in some of the best anthropological laboratories of Germany and Switzerland, is working over the skull collection made in the course of the Jesup expedition. The data are to be used in the final report on the physical anthropology of the Jesup expedition.

THE cover design of this number of the JOURNAL is from a photograph by Mr. Carl E. Akeley, taken in 1910 on his latest expedition to Africa. It represents a herd of impalla come to drink in the Tana River and is to serve as a study for a portion of the background of a hippopotamus group planned by Mr. Akeley as one of a series for the new African hall in the American Museum. The antelopes approach the water timidly, probably smelling the tracks of lions and leopards which use the same runways to the river, and startled into fear of these enemies behind them and of the crocodiles in the water in front of them, by every sound of the monkeys in the trees and every movement of the hippos on the sand-bars a few yards away.

ON Friday evening, November 21, there will be a public meeting in the large auditorium of the Museum under the joint auspices of the American Museum of Natural History, the American Scenic and Historic Preservation Society, and the National Committee for the Preservation of the Yosemite National Park, with the coöperation of many civic organizations throughout the United States, to protest

against the act pending in Congress proposing to grant the Hetch-Hetchy Valley in the Yosemite National Park for water-storage purposes. Addresses by Prof. Henry Fairfield Osborn, president of the Museum; Dr. George F. Kunz, president of the Scenic Society, Mr. Robert Underwood Johnson, chairman of the National Committee; Dr. Douglas W. Johnson of Columbia University, and others will discuss the economic, geological and scenic features of the question at issue. The picturesque beauties of the Yosemite will be illustrated upon the screen. The importance of the occasion is indicated by letters from ex-President Taft, Cardinal Gibbons, President-emeritus Eliot of Harvard University and other distinguished citizens in sympathy with the meeting.

On the evening of November 3, the section of Geology and Mineralogy of the New York Academy of Sciences will entertain the members of the Academy and its Affiliated Societies at a general meeting and reception to be held in the auditorium and the adjoining Eskimo hall of the Museum. The speaker of the evening will be Prof. Ellsworth Huntington of Yale University, who will discuss the problem of climatic changes in the past, outlining and illustrating by lantern slides the evidence as shown in his investigations in central and western Asia and in California and the Southwest. This entertainment of the Academy in November by the Section of Geology is the first of a series of four social evenings to continue through the winter months. The further meetings will be under the auspices respectively of the Sections of Biology, Astronomy and Anthropology.

Dr. Rudolf Wagner, who is about to undertake an investigation of the several Spanish dialects in Mexico and to collect folklore from both the Indian and the Spanish-speaking populations, recently visited the Museum, paying especial attention to the Mexican hall.

The National Association of Audubon Societies met at the Museum on October 28, when the following officers were elected: Mr. William Dutcher, president; Dr. T. S. Palmer, first vice-president; Dr. F. A. Lucas, second vice-president; T. Gilbert Pearson, secretary; and Jonathan Dwight, treasurer. In addition to these members the following were elected to the Board of Directors: Dr. J. A. Allen, Dr. George Bird Grinnell, Dr. Frank M. Chapman, Mrs. Mabel Osgood Wright, Mr. W. W. Grant and Mr. Charles Sheldon. The report of the secretary showed that the Society has expended more than $80,000 in bird protection during the last year. Junior Audubon classes under the direction of the Association have been organized and 52,000 members are enrolled. The Board of Directors at this meeting offered a reward of $250 for the arrest and conviction of the man who shot John C. Reinbold, game warden in Hackensack, New Jersey. One of the important features of the Association's work during the past year has been its participation in arranging for the Niobrara Reservation in Nebraska, where a herd of elks has been established.

The fourth annual Teachers' Day of the American Museum of Natural History will be held at the Museum on the afternoon of Saturday, November 8. There will be brief addresses in the auditorium by Dr. John H. Finley, Commissioner of Education of the State of New York and Dr. William H. Maxwell, Superintendent of the Public Schools of New York City, after which the guests will visit the bird and mammal halls and gather for an informal reception and afternoon tea in the north bird hall.

The American Ornithologists' Union will convene November 10 at the Explorers' Club for the first meeting of its thirty-first annual congress. The program of the three days of the Congress will include sessions for the presentation of

scientific papers, an inspection of the ornithological laboratories of the American Museum, and a visit to the Zoölogical Park and Aquarium at the invitation of the New York Zoölogical Society. The members of the Union will be the guests of the Linnæan Society of New York each day for luncheon at the Museum.

Mr. N. C. Nelson, having returned from his explorations of Puente Viesgo, almost immediately proceeded to resume his archæological reconnaissance in the Southwest.

The first of a series of science stories for children of members of the Museum will be given on Saturday morning, November 1. Through the courtesy of Mr. Robert W. Priest of the Gaumont Company, Limited, of London, the Museum has secured the privilege of showing in this lecture the motion pictures taken by Herbert G. Ponting, F. R. G. S., on the last expedition of Captain Scott to the South Pole. The pictures give a marvelous revelation of the habits of the seals, penguins and gulls of the Antarctic, which having no acquaintance with man, have in consequence no fear of him, so that Mr. Ponting was able to approach within a few feet of them in taking the pictures.

The fourth annual exhibition of the New York Aquarium Society was held at the Museum from October 6 to 12. The exhibition consisted for the most part of tropical fresh-water fishes which were attractively displayed in aquaria and looked as though they were swimming in quiet streams among the fine vegetable life of their natural habitat. Among the representatives of the *Characin* family were the rare *Myletes* which look like silver coins, the *Leporinus* with their long vertical stripes and the *Gasteropelecus*, an extraordinary-looking fish with a deep bladelike breast. There were various species of the *Cichlids*, the most notable of which were the *Pterophyllum scalare*, a little-known fish with elongated fins, which was brought from the interior of Brazil and exhibited in this country for the first time this year, and the "mouth-breeder" of Africa which carries its eggs in its mouth until they are hatched. The *Tetrodon cutcutia* which had never before been exhibited in the United States is especially rare and interesting. It has a hard beak like a parrot and is called a "blow-fish" from its habit of swelling up to intimidate its enemies. This is one of the few fresh-water representatives of an abundant salt-water group. The tooth carps family was represented by many forms, among them the rare *Fundulus gularis*, the male of which has a brightly colored tail, and the *Belonesox* which, more than any other species in the family, shows a close resemblance to the pickerel in feeding habits. Other rare and equally interesting fish were exhibited and much credit is due to the Society for its success in assembling a collection so unique.

The annual fall exhibition of the Horticultural Society of New York opened for private view at the American Museum on the evening of October 31 and continued for public view both day and evening through November 4. The display which was visited by some 170,000 people, was the most splendid of recent years, including several bush chrysanthemums fourteen feet in diameter and bearing two thousand or more flowers each. One of the minor exhibits occupying a small alcove in the hall of the Indians of the Plains was presented by the Park Department of Manhattan and Richmond on the work of the Bureau of Children's School Farms. Descriptions of the shop work and the garden work, photographs of the children at work in the garden plots and samples of the vegetables and fruits grown in the gardens went far toward convincing the visitor that probably in no better way than this can the children of a great city be taught elementary agriculture and forestry, manual training, physical culture, and even sanitation and hygiene.

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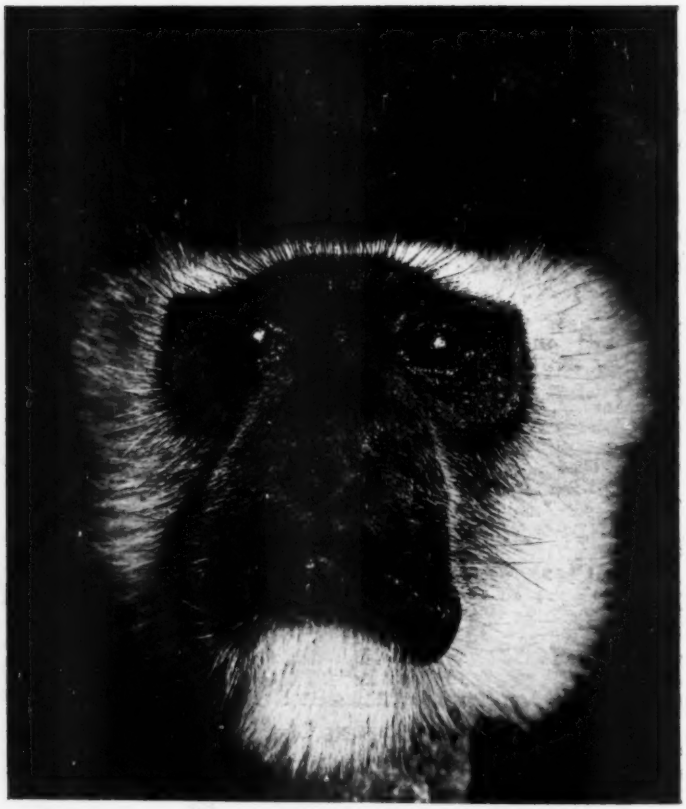

The colobus monkey is found only in African forests. It is persistently hunted by the Dorobo who eat its flesh and use its beautiful fur in their dress